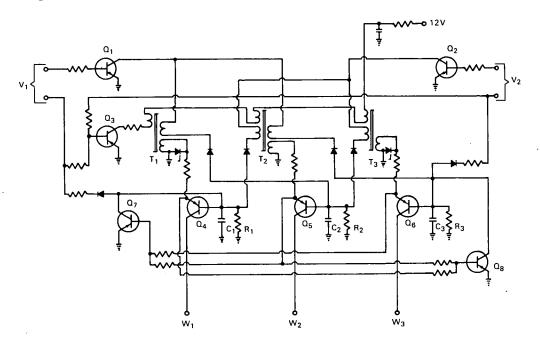
NASA TECH BRIEF



NASA Tech Briefs are issued by the Technology Utilization Division to summarize specific technical innovations derived from the space program. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.

Magnetic-Shift-Register Circuit Controls Step Motor Operation



The problem: To design a controller to perform the signal conditioning required for bidirectional operation of a phase-pulsed step motor. Previous solid-state designs have the disadvantages of appreciable power drain in the standby mode plus susceptibility to switching transient interference due to their regenerative characteristic.

The solution: A single line magnetic-shift-register circuit that draws no power in standby and is non-regenerative and therefore insensitive to switching transients. Separate input terminals make it possible to drive the step motor either forward or backward.

How it's done: Drive pulses are applied at V_1 for forward operation and at V_2 for reverse operation.

Transistors Q_1 and Q_2 perform switching functions for "storage" selection. The square-loop magnetic core memory elements T_1 , T_2 , and T_3 hold the pulse data until operation of the single shift line through Q_3 shifts the data to the temporary storage elements R_1 C_1 , R_2 C_2 , and R_3 C_3 . Output pulses are taken from terminals W_1 , W_2 , and W_3 through transistors Q_4 , Q_5 , and Q_6 , respectively.

For forward operation, the input pulse is applied directly to C_1 and an output pulse is produced at W_1 . Subsequent pulses shift the pulse data from T_1 and T_2 to produce output pulses first at W_2 and then at W_3 . Feedback through inhibit transistor Q_7 prevents pulses from appearing at W_1 during this interval. For reverse operation, the input pulse is applied directly to

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government, nor NASA, nor any person acting on behalf of NASA: A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in

this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately-owned rights; or B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this document.

 C_3 and stored in T_3 and T_2 . Feedback in this mode is through inhibit transistor Q_8 .

Notes:

- 1. This design can accommodate any number of stages.
- 2. This invention should have wide application in step motor drive systems.
- 3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer Goddard Space Flight Center Greenbelt, Maryland, 20771 Reference: B65-10226 Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Leo J. Veillette (GSFC-340)

Category No. 01

Brief 65-10226